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BY

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TEACHING SAFETY THROUGH THE APPROVAL PLATE[1]

By L. C. Ilsley[2]

The plate of every approved motored-type machine carries the seal of the United States Bureau of Mines. The heading "CAUTION" thereon calls attention to certain additional information applying to the upkeep of the machine in safe condition.

In the first bureau approval plates, the caution statement was very simple, containing two brief paragraphs with the following wording:

CAUTION

The permissibility of this equipment depends upon the absence of openings in the inclosing casings.

Cover plates should be screwed on tight and the casings frequently inspected for openings.

As the approval work continued the value of the approval plate as a means of assisting maintenance of equipment was recognized, and various items affecting the safety of the equipment as a whole were added until a typical caution statement is now several paragraphs in length. The following example is quoted from the approval plate of a recent permissible outfit:

CAUTION

THIS EQUIPMENT IS NOT PERMISSIBLE EXCEPT WHEN USED UNDER THE FOLLOWING CONDITIONS:

1. GENERAL SAFETY: Frequent inspections must be made to see that all electrical parts, including the trailing cable and the wiring, are kept in a safe condition. There must be no openings into the casings of the motor or other electrical parts. A permissible junction box must be used in connecting to the power circuit unless connection is made in pure intake air or to a permissible power truck. The positive conductor of the trailing cable must be connected to the positive terminal of the control.

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2 Electrical engineer, U. S. Bureau of Mines.

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2. FASTENINGS: Cable glands and all bolts, nuts, screws, and other means of fastening must be in place, properly tightened and secured. Motor hand-hole covers must be kept sealed and the control cover padlocked to the casing. Only one sealing tool and key shall be available and they shall be placed in the care of an authorized person.

3. RENEWALS AND REPAIRS: Inspections, repairs, or renewals of electrical parts must not be made unless the trailing cable is entirely disconnected from the circuit furnishing power and the cable must not be connected again until all parts are properly reassembled. Special care must be taken in making renewals or repairs. Leave no parts off. Use new parts exactly like those furnished by the manufacturer. When wiring at the cable entrances is disturbed, the stuffing boxes must be repacked tightly and the gland nuts secured against loosening.

4. CABLE REQUIREMENTS: An approved-type trailing cable protected by a fuse or other automatic circuit-interrupting device must be used. Special care must be taken in handling the cable to guard against mechanical injury and wear. Spliced cables must not be used unless the splices are properly made and vulcanized.

5. 500-VOLT EQUIPMENT: The operating voltage must not exceed 500 volts at the motor terminals.

The Bureau of Mines believes that, of two machines identical in so far as construction is concerned, the one bearing an approval plate will be given not only better but more intelligent attention. The fact that certain definite items are listed in the caution statement and thereby brought to the attention of repairmen or inspectors for their guidance should be decidedly helpful in the maintenance of equipment. When the approval plate is absent there is no substitute for these constructive suggestions, and the repairmen, not being especially trained to look for the little details that may affect the safety of the equipment, will probably overlook some vital maintenance needs. The warning that identical parts must be used in making renewals should also be helpful to the repairmen in obtaining the proper material through the purchasing department rather than some cheaper substitute, as often happens in the best regulated mines. The further warning that no additional parts can be installed without destroying the permissibility of the equipment should be especially valuable in minimizing dangerous, unsafe, and unapproved innovations proposed by an overzealous electrician or mine foreman.

The caution statement on approval plates should be of real service to both company and State inspectors in pointing out essential items for an external check of the condition of machines bearing them. If an inspector is asked what is to be done to maintain equipment properly he has a definite procedure already outlined for him in the caution statement. Any machine maintained in compliance with all the requirements thus outlined will be well on the road to safety, and any electrician that takes such an interest in these requirements as to understand their intent and purpose thoroughly should have no trouble in keeping his

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equipment reasonably safe or at least be able to report upon its degree of safety, as measured by the safety goal that has been set.

External Evidences

Many external evidences come to the Bureau of Mines from time to time indicating that the approval plate is teaching safety lessons in several ways.

To a certain extent manufacturers are put on their honor in placing approval plates on machines. The bureau has no follow-up system in connection with the approval plate similar to the label service of the Underwriters' Laboratories, but leaves the matter of placing the approval plate only on suitably designed machines in the hands of the machine manufacturers. At its Pittsburgh Experiment Station the bureau keeps on file detailed information covering the construction of a given permissible outfit and authorizes the manufacturer to place specifically worded approval plates on such designs as agree exactly with the record drawings. To keep faith with this trust the machine manufacturer does several things that bear directly on safety and aid greatly in maintaining the integrity of approval. One practice of most manufacturers is to have a special factory inspection sheet, which is filled out for each permissible outfit; this record is kept on file by the manufacturers as evidence that when the machine left the factory it was properly designed and assembled. A typical factory inspection sheet for a permissible compartment follows:

Motor for Coal-Cutting Equipment

1. Are there any openings or holes, small or large, in shell other than drawings call for? _____
2. Are all flanges for covers free from blow holes? _____
3. Are all flange surfaces smooth? _____
4. Do all flange joints fit tightly? _____
5. Is width of contact between motor shell and end plate 1-1/4 inches or more; between hand-hole covers and shell 1-1/4 inches or more; between motor shell and pinion end bearing housing 2-1/4 inches or more _____

   (Note: The width of contact and not width of flange is considered by the U. S. Bureau of Mines.)
6. Do holes for top studs in motor shell at gear end cut through? _____
7. Are bottom studs in motor shell at gear end riveted over? _____
8. Are studs in motor shell for cover for brush opening riveted over? _____
9. Do holes for studs in motor shell for end plate cut through? _____
10. Do holes for cap screws in end plate for cap cut through? _____
11. Do holes for studs in motor shell for guard cut through? _____
12. Do holes for cap screws in motor shell for guard cut through? _____
13. Do holes for machine bolts for cable clamp block cut through? _____
14. Do holes for cap screw for cable clamps inside motor shell cut through? _____
15. Are there lock washers under all cap screws on motor end plate, on end plate cover, on guard for terminals? _____
16. Are there lock washers under all study nuts? _____
17. Does the key in the gear end housing have a snug fit in keyway in the motor shell? _____

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18. Are proper terminal studs, bushings and collars used through shell? _____
19. Are terminal studs tight? _____
20. Are cable terminals properly locked to terminal studs? _____
21. Is the special hose securely clamped? _____
22. Is the special hose clamp and terminals protected by proper cover? _____
23. Is the key for the gear end housing riveted in place? _____

Because of the special inspection form and the more careful shop work required on permissible equipment factory employees soon recognize that machines that are to carry the Bureau of Mines plate should receive special attention and a certain respect for essential safety requirements is engendered.

Many companies train special service men to look after the maintenance in condition safe for use of permissible machinery in the field. Often these men spend a short time with the bureau witnessing the tests and detailed inspection of equipment and thus become well versed in all the details for which the approval plate stands. These service men are in close touch with practical operation of the machine and have an unusual opportunity to point out the proper way to use permissible equipment and call attention to its misuse. Recently a manufacturer reported that one of these service men, on seeing a machine in a condition that did not comply with specifications on the approval plate, had taken what might be considered a rather high-handed position with the operator; he told the latter that permissible equipment could not be used that way and took the plate off the machine. It is understood that the operator recognized the justice of the service man's position; the machine has since been reconditioned and the plate replaced. This incident shows that to this service man the approval plate stood for something more than a piece of brass.

Some approval plates become broken or lost, and coal companies have been reported to have ordered replacement plates as they would other needed supplies; but owing to responsibility of the machine manufacturer in maintaining the integrity of the approval he must assure himself that a machine is in condition to have the new plate attached. Especially is this desirable since, as already shown, more recent approval plates cover items not considered in the earlier approvals. Some operators have wished to convert flame-proof machines to permissible equipment. This is sometimes done at the mine, but before an approval plate is put on any reconstructed machine the manufacturer must assure himself through his trained service man that the machine is in proper condition to receive the approval plate. Often this requires certain new compartments and complete overhauling of the machine. Certain operators have made use of the service man to give their permissible equipment a thorough inspection which, because of his special training, he is often better qualified to give than a company employee. Thus it can be seen that through the service man and his guardianship of the integrity of the approval plate the operator can not help being impressed with the safety principles for which it stands.

The operator often takes the initiative in carrying out safety principles embodied in the approval plate. One large company has on several occasions refused to let equipment be placed in use, although it was known that the machine was of a permissible design, because the approval plate had not yet been attached to the outfit. This company has some gassy mines, and in these it was desirable that the local officials be accustomed to use no equipment that did not bear the safety label of the bureau. The fact that a number of

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the large coal companies are obtaining vulcanizing outfits would seem to indicate that the recommendation that all splices in trailing cables be vulcanized has been taken to heart and recognized as an essential safety precaution. These are encouraging signs that the operator values the safety lessons underlying the caution statement.

State inspectors also value this safety symbol. The Bureau of Mines has received many inquiries from inspectors in regard to the time when the plate could be placed on a given outfit, and in certain instances inspectors did not permit its use until the plate was attached. An inspector feels a security with an outfit that has met all the requirements of the bureau that he can not have with any other equipment, regardless of the safety the manufacturer or operator may claim for it. One State mine department had several of its inspectors spend about a week at the Pittsburgh Experiment Station to familiarize themselves with all the details of approved equipment so that they might better check the maintenance practices in connection with the everyday use of permissible machines.

Where electricity is adjudged to have been the contributing cause of disasters the commision of State inspectors usually recommends the future use of nothing but permissible outfits. The only State issuing approvals has discontinued that practice in favor of approvals issued by the United States Bureau of Mines. The Bureau of Mines has received a great deal of assistance from the approval system in its campaign for safety.

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